ASSESSMENT FRAMEWORK
FOR COMPENSATORY MITIGATION IN CALIFORNIA: A WATERSHED APPROACH

Training Syllabus In Support of the California Wetl and Area Protection Policy (WAPP)

September 8, 2011 draft (rs)

INTRODUCTION

The California State Water Resources Control Board (State Water Board) is preparing this training syllabus in collaboration with the California Wetland Monitoring Workgroup (CWMW). The syllabus describes an assessment framework for making determinations about whether proposed compensatory mitigation is adequate to offset proposed impacts to aquatic resources. Compensatory mitigation is usually required to offset unavoidable impacts as may be authorized under the authority of the Porter-Cologne Water Quality Control Act and/or by a federal Clean Water Act Section 404 permit. In addition, the State's proposed Dredge and Fill Rule and the 2008 federal Compensatory Mitigation Rule further specify that mitigation be implemented using the "watershed approach." The assessment framework is based on the use of a watershed approach.

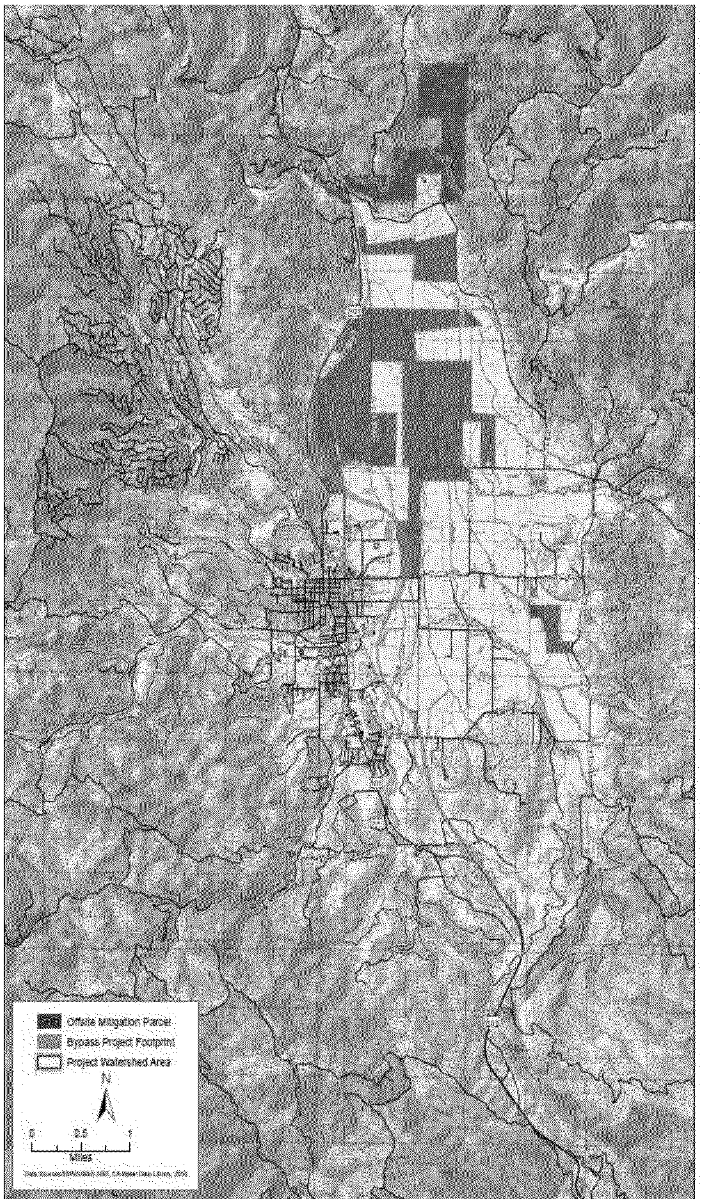

Figure 1. An example of a project watershed area fo r mitigation project review

Assessment framework is defined in this syllabus as a system for the gathering, management, interpretation and reporting of information for aquatic resource regulation and management. It describes how environmental monitoring and assessment information is applied and interpreted to make a regulatory decision.

The syllabus was prepared for use by regulatory agency staff, consultants and the regulated community. It outlines the assessment procedures and indicators used to make mitigation determinations. A more in-depth review of assessment is accomplished in training sessions. This document can be used to guide such training, hence use of the term "syllabus."

The design of the syllabus is based somewhat on the Washington Department of Ecology document entitled, "Selecting Wetland Mitigation Sites using the Watershed Approach" (Hruby et al., 2009). Also, the syllabus is intended to complement the U.S. Army Corps of Engineers, South Pacific Division's Standard Operating Procedure for Determination of

Mitigation Ratios (USACE, 2011).

The first section of the syllabus describes an assessment framework. It also includes a list of mitigation planning principles that form the foundation of the framework. The second section describes the seven review factors used in the framework. They are:

(1) Impact site description
(2) Impact site condition
(3) Mitigation category
(4) Mitigation consistency with watershed profile and watershed goals
(5) Mitigation site suitability – Landscape review
(6) Mitigation site suitability – Field review
(7) Mitigation performance standards

The seven review factors are presented in the order that they are generally considered in the mitigation review process.

Assessment information gathered from an example project is used to demonstrate how parts of the assessment framework are used (See Figure 1). The project was selected because it exemplifies a situation where decisions had to be made in a relative quick manner and involving highly valued wetlands and associated aquatic resources.

The third section of the syllabus provides a summary of how assessment information is drawn together to make a narrative determination about the general amount of mitigation needed to offset unavoidable project impacts.

An appendix to the syllabus provides a set of "Questions and Answers" to help clarify concepts and uses of the assessment framework, including its use for alternatives analysis and cumulative impact analysis.

Background

Regulatory agencies require compensatory mitigation from permit applicants for unavoidable impacts. State and national studies of wetland mitigation, however, have shown a disappointingly low success rate in meeting performance measures and replacing wetland functions (National Research Council 2001; Ambrose et al. 2007; Mack and Micacchion. 2006; Reiss, Hernandez and Brown. 2007). The studies identify two main reasons. First, there has been an institutional bias toward on-site mitigation. Past policies and practices have over-emphasized the need to replace lost functions near impacted aquatic sites rather than selecting mitigation sites that best fit with the mitigation goals for the project and the watershed. Second, there has been overuse of easily acquired mitigation project sites. Those sites often come with ecological constraints that limit their potential functional performance. The published studies demonstrate a clear need to modify past practices.

In the last ten years there has been a general shift in national and state policies toward using watershed-based approaches to make mitigation determinations. Recent guidance recommends that mitigation be done in areas where ecological processes can be restored, unless it is ecologically necessary to maintain the affected functions near the impact site (Hruby et al. 2009, USACE & EPA 2008). While this shift in policy is becoming widespread among regulatory agencies, there is a lag in practitioners actually using a watershed approach for making mitigation determinations. Also, there is an overall lack in availability of methods and training for the approach.

In California, steps have been taken to fill gaps in the availability of assessment methods and training with the Wetland and Riparian Area Monitoring Program (WRAMP). WRAMP lays out a set of tenets to be followed in order to apply the best available information for decision-making (WRAMP, 2010). One of the core tenets is use of three levels of assessment ("1-2-3 Approach"):

> Level 1: Broad-scale mapped information that helps generally characterize aquatic resource occurrence ("watershed profile") and watershed needs,
>
> Level 2: Site specific information gathered in a relatively rapid manner. The California Rapid Wetland Assessment Method ("CRAM") is a Level 2 method.
>
> Level 3: Site specific information gathered in a more rigorous manner. This type of information helps address environmental and mitigation issues of heightened concern, for example the occurrence of special status species or pollutants. Level 3 information also is used to validate rapid assessment methods, characterize reference condition, diagnose the causes of aquatic resource condition, and analyze the functioning of aquatic resources.

In simplest terms, an assessment framework has been developed that takes advantage of WRAMP and its tenets to improve regulatory decision-making and mitigation. The framework has been formatted as this training syllabus to aid mitigation practitioners.

SECTION 1: OVERVIEW OF ASSESSMENT FRAMEWORK

The assessment framework for compensatory mitigation has evolved alongside lessons learned from science-based studies of mitigation project success. It is compatible with standard operating procedures that are in current use for making mitigation determinations. The process of aligning the lessons learned from science with standard operating procedures begins with a listing of mitigation planning principles, which can be thought of as "best practices".

Planning Principles for Compensatory Mitigation

The assessment framework is based on the following principles:

1. All permit decisions must comply with applicable federal and state rules requiring permit applicants to take all appropriate and practical steps to avoid and minimize adverse impacts to waters of the State and to waters of the United States.
2. Permit applicants are responsible for submitting to permitting authorities the information needed to make reasoned determinations about whether proposed compensatory mitigation is acceptable and consistent with the watershed approach. Permitting staff are responsible for understanding how requested assessment information will be used to inform their decision-making.
3. Mitigation should be located where it will help protect or restore the health and condition of aquatic resources within a watershed or related geographical area that encompasses a project impact site. This principle is also expressed in terms of mitigation meeting "watershed needs" and "watershed goals." The two terms are synonymous, and this syllabus uses the term "watershed goals."
4. The "Level 1-2-3 Approach" for aquatic resource assessment can be used to ascertain mitigation needs and opportunity. The selected rigor of assessment should be commensurate with the magnitude of impact associated with a proposed project.
5. A "watershed profile" provides a relatively simple way of characterizing watersheds and identifying watersheds needs. Profiles are described below in the "Watershed Criterion" section.
6. Wherever possible, existing watershed and environmental planning information should be analyzed in advance of mitigation to:
   - determine the location of relatively intact, natural areas in a watershed,

- Identify those areas for preservation and protection, and
- Identify nearby degraded areas that are amenable to enhancement, restoration or establishment, and that would contribute to the sustainability of natural areas and the overall health of a watershed's aquatic resources.

7. When watershed and environmental information is not readily available, project impact sites and mitigation sites can be evaluated using knowledge of basic landscape ecology principles and watershed management goals (e.g., Principle #3 above).

8. Assessment results may indicate that on-site mitigation is appropriate when:
   - the aquatic resource at the impact site is of significance to the ecological condition of the watershed;
   - the on-site mitigation opportunities have a high likelihood of successfully replacing the functions lost at the impact site; and,
   - The mitigation is consistent with watershed goals.

9. A watershed approach may be used to justify use of more than one mitigation site to provide compensation for an impacted aquatic resource. For example, it may be ecologically advantageous and consistent with a watershed profile and watershed goals to restore or enhance different types of aquatic resources at multiple locations.

10. The watershed approach underscores the concept that existing mitigation "replacement ratios" must take into account aquatic resource acreage and/or length, as well as ecosystem condition and rates of function. Aquatic resource area abundance, along with ecosystem condition and landscape position, controls the delivery of ecosystem services. In such analysis condition takes into account the ecological integrity an aquatic resource, including whether it was converted to another type of resource or was otherwise rendered atypical by stressors.

11. Use of a watershed approach may sometimes result in mitigation of aquatic resources that are of different types (e.g., hydrogeomorphic wetland type) and/or that provide different levels of function than impacted aquatic resources. This may be preferable if assessment shows that the "out-of-kind" mitigation fits within the broader watershed profile and would better address watershed needs. This situation commonly occurs in urban or urbanizing areas, and when addressing the habitat recovery needs of special status species.

Applying the Watershed Approach to Wetlands in Urbanizing Areas

In urbanizing areas, wetland functioning is commonly altered from natural reference levels because of local environmental stress and degraded conditions. This is particularly true for wetlands in highly modified watersheds where ecological processes are unlikely to be restored. In some cases, it may be preferable to compensate for impacts to those wetlands by locating mitigation sites at other locations that have a lesser degree of urbanization. In other cases, there may be opportunity to mitigate aquatic resource impacts within an urban watershed by implementing compensatory mitigation projects that both supplement and that can be ecologically supported by planned water quality management projects. The enhancement of existing urban wetlands is possible within a planned "green-infrastructure" development scenario. For example, compensatory mitigation can complement low impact development (LID). However, mitigation projects cannot be "double-counted" toward meeting multiple regulatory requirements (e.g., combining compensatory mitigation credits and required stormwater management specifications).

Assessment Framework

Federal and state rules for the discharge of dredge and fill material require use of a watershed approach when making decisions regarding authorization of a regulated activity that would impact an aquatic resource. The assessment framework described in this syllabus outlines a criterion that represents the watershed approach. The consistency or compliance of a permit application and mitigation plan with this criterion is evaluated using seven review factors that are detailed in Section 2 of this syllabus. Three levels of information can be used in the review. A weight-of-evidence approach is then applied to evaluate collected assessment information, and to make a well-documented technical determination as summarized in Section 3. The role of weigh-of-evidence analysis in environmental assessment is summarized by Linkov et al. (2009).

The Watershed Criterion

In this framework the watershed criterion is that compensatory mitigation proposed to offset unavoidable aquatic impacts should sustain and improve the overall abundance, diversity and condition of aquatic resources in a project watershed area. "Watershed profiles" are a technical representation of the watershed criterion.

A watershed profile is a graphical account of the abundance, diversity and ecological condition of aquatic resources in a geographically-bounded area called a "project watershed area" (see Figure 2). The project watershed area can be an actual watershed or some other ecologically meaningful unit of the landscape. The project watershed area also should encompass the geographical extent of aquatic resources that would be affected by a permitted project.

A watershed profile includes an estimate of the occurrence of aquatic resource types in a project watershed area. The precision of the estimate should be commensurate with the magnitude of project impacts and mitigation needs. For many routine assessments, a watershed profile can be generated based on a review of existing information and use of best professional judgement.

A "wetland landscape profile" specifically depicts the wetland component of a watershed profile. More specifically, wetland landscape profiles stratify wetland area by hydrogeomorphic (HGM) class (Brinson 1993). Throughout this document, wetland type generally means a wetland's HGM type and includes the option of

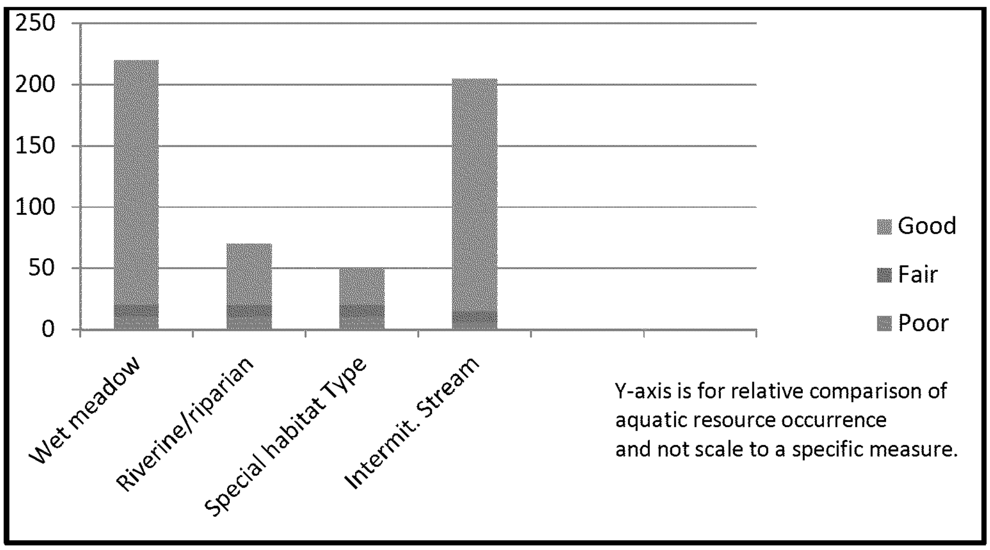

Figure 2. Hypothetical watershed profile

adding a NVC modifier. However, other classification systems may be used with HGM classification depending on the geographical region and watershed goals. For example, the National Vegetation Classification System (NVC) includes listings for different types of wetlands (FGDC 2008). NVC can be used to subclassify HGM wetland types, for example "HGM: Slope, NVC: Alpine-Montane Wet Meadow" or "HGM: Slope, NVC: Subalpine-Montane Fen."

The theory behind using watershed profiles is that the abundance, diversity and condition of aquatic resources influences landscape function (Bedford 1996, Bedford 1998, Gwin et al. 1999, Johnson 2005). In turn, a well-functioning landscape helps sustains beneficial hydrology and supports the delivery of ecosystem services. Those services include the provisioning of habitat, flood control and water quality among others (Millennium Ecosystem Assessment, 2005). Ecosystem services can be aligned with the beneficial use designations for aquatic resources.

Accordingly, the criterion to sustain or improve a watershed profile is analogous to an expression of "watershed goals." Watershed goals also can be expressed in more definitive terms based on the results of watershed planning and analysis activity. For example, a watershed goal for some watersheds in California is the sustainability of stream flow and water quality. A watershed goal for other watersheds is recovery of an anadromous fishery.

Review Factors

The assessment framework identifies seven review factors (detailed in Section 2) that are considered when making a determination about the environmental acceptability of compensatory mitigation. The factors guide a reviewer in the use of monitoring and assessment information to make a reasoned determination about the risks and the acceptability of a mitigation project proposal. The first two factors apply to impact site assessment, and the remaining five factors apply to the assessment of a proposed mitigation site.

Figure 3 shows the factors within the assessment framework. A reviewer uses the figure as a "checklist" to summarize the results of their assessment. The factors are listed in Column A of the figure and high risk concerns for each factor are listed in Column B.

"Level 1-2-3" assessment methods developed by WRAMP are used to assess and evaluate each of the factors. The factors used in the review are:

(1) Impact site description
(2) Impact site condition
(3) Mitigation category
(4) Mitigation consistency with watershed profile and watershed goals
(5) Mitigation site suitability – Landscape review
(6) Mitigation site suitability – Field review
(7) Mitigation performance standards

Information gathered from the assessment of each factor is drawn together and is used to evaluate whether or not proposed wetland mitigation will sustain and improve the watershed profile of a project watershed area. The evaluation is based on weight-of-evidence.

If the results of the evaluation show that a mitigation proposal is not sufficient to offset impacts, then assessment information can be used to modify the proposal with a more environmentally acceptable design.

General Compensatory Mitigation Requirements

The assessment framework is applied alongside existing compensatory mitigation requirements and local procedures. Compensatory mitigation must be based on the watershed approach to the extent appropriate and practicable, and commensurate with the degree and the scope of impacts of authorized activity. In general, proposed compensatory mitigation should be located within the same watershed or mitigation service area as the impact site, and where it is most likely to successfully replace lost functions. Functional replacement is achieved when a mitigation project site is of an appropriate size, aquatic resource type, design, and ecological condition that complements the watershed profile and supports watershed goals. Functional replacement is evaluated using performance standards.

Compensatory mitigation will typically be required using a minimum of a 1:1 replacement ratio, on an acreage and/or linear distance basis, and if proposed as aquatic restoration or establishment. However, standard procedures used to review mitigation project proposals, including use of the described assessment framework, can lead to higher ratios. The adjustment of a ratio will depend on the category of mitigation and the risks attributed to mitigation success. For example, ratios for enhancement type mitigation can range from 4:1 to 20:1. Mitigation practices for enhancement can include the use of innovative grazing practices and invasive weed control. Ratios for preservation type mitigation can range from 10:1 to 20:1, and are based on the level of risk to an existing natural area.

Applicants may choose to develop mitigation plans that reflect higher replacement ratios as a way of reconciling risk or temporal loss attributed to their particular mitigation plan. Also, state and federal regulators may require additional administrative assurance in situations involving higher risk mitigation including difficult to replace types of aquatic resources. Additional administrative assurances include the use of higher performance bonds and more restrictive adaptive management plans. Proposed mitigation plans should address all required elements described in the (draft) California Dredge and Fill Rule and the 2008 federal Compensatory Mitigation Rule.

The assessment framework described in this syllabus makes transparent a technical review process that can be used to review mitigation proposals in California. Also, the framework provides the regulated community with a set of explicit expectations for compensatory mitigation projects and mitigation plans. Mitigation plans that do not meet those expectations or do not otherwise reconcile deficiencies are less likely to receive favorable review.

SECTION 2 – MITIGATION ASSESSMENT FACTORS

A determination is made for each the following seven review factors by using best professional judgment, by using existing information, and/or by gathering new information.

For each of the review factors, the mitigation reviewer may choose to reconsider the preliminary determination using best professional judgment. In that situation, the reviewer should document his/her decision by describing the indicators and narrative criteria that guided the determination.

<u>The results of assessment are summarized by checking the appropriate boxes in Figure 3 (next page).</u>

The level of effort required to conduct a mitigation evaluation, using the assessment factors, is commensurate with the perceived magnitude of impact cause by a proposed development project and the amount of uncertainty associated with mitigation. The level of effort also depends on the skill-set of practitioners, the time available to conduct an evaluation and the availability of assessment methods to efficiently gather new information.

ASSESSMENT FRAMEWORK FOR COMPENSATORY MITIGATION ASSESSMENT CHECKLIST			
A. Assessment Results (√)		B. High-Risk Concerns (√)	
1. Impact Site Description			
Amount of area and magnitude of effect (Check if known)		Large area and long term Impact	
Aquatic resource type (Check if known)		Rare type	
Special Status Resource (Check if known or not present)		Documented special resource	
2. Impact Site Condition			
Good		Good condition or easily returned to good condition. For urban areas use “fair” condition	
Fair			
Poor			
3. Mitigation Category (See Table 1)			
Restoration		Preservation category or establishment of an aquati c resource type that has not been successful establis hed	
Enhancement			
Preservation			
Establishment			
4. Mitigation Consistency with Watershed Profile and Watershed Goals			
In-kind and improve profile		Out of kind, not improve profile, and inconsistent with watershed goals	
In-kind and sustain profile			
Out-of-kind, improve profile			
Out-of-kind, not improve profile			
5. Mitigation Site Suitability- Landscape Review (See Table 2)			
Ecologically suitable		Unsuitable or uncertain suitability	
Unsuitable			
Suitability is uncertain			
6. Mitigation Site Suitability- Field Review (See Table 5 and Table 6)			
Ecologically suitable		Unsuitable or uncertain suitability	
Poor suitability			
Suitability is uncertain			
7. Review of Performance Standards			
Mitigation project involves use of a mitigation bank or site that has met performance standards.		Use of a difficult to replace wetland type for miti gation, not involving a mitigation bank and with no performance standards	
Mitigation project will use an existing set of performance standards.			
Mitigation project involves a wetland type that is difficult to replace, and there are no performance standards			
MITIGATION DETERMINATION			
No net loss considering aquatic resource quantity a nd quality: Standard mitigation ratios and assurances (No high-risk concerns)			
Insufficient mitigation to ensure no net loss of aq uatic resource: Increased mitigation ratios and assurances required (One or more high-risk concerns)			
Insufficient information to make a reasoned decisio n: Request made to permit applicant for more informati on (One or more review factors not a ssessed)			

Figure 3 – Assessment framework used to evaluate the environmental acceptability of compensatory wetland mitigation

Review Factor 1. Impact Site Description

Record the amount of area or linear footage of an aquatic resource type that will be directly and indirectly impacted by a proposed project. A "high risk" notation is made when the area is known to have special status species or has other special features including a rare type of aquatic resource. High risk notation also is made if the impact area is large, relative to other permitted activity in the region, and if the magnitude of its effect is expected to cause a loss, a conversion or long term degradation of an aquatic resource.

As mentioned in Section 1, wetlands at a proposed impact site can be classified in terms of both their HGM type and NVC class. The characterization of special status species at a proposed impact site is completed using procedures identified by the reviewing fish and wildlife management authority. A determination of whether a wetland type is "rare" is based on review of the watershed profile. A determination of "large" impact area takes into consideration the permitting history in the project watershed area and the amount of occurrence of aquatic resource type in the area. Degradation in this instance means reduced aquatic resource condition from a higher to a lower condition class

Review Factor 2. Impact Site Condition

Impact site assessment is a component of the overall assessment framework. A "high risk' notation is made if the impact site is in good ecological condition, or can be reasonably returned to good condition with minimal management activity. An aquatic resource in good condition is one that is functioning at rates typical of its type in a least-disturbed landscape setting. The risk is attributed to the difficultly in restoring, enhancing or establishing a wetland to good ecological condition.

Impact site assessment is conducted using procedures described in the user manual for the California Rapid Assessment Method (Collins et al., 2006). The CRAM assessment begins by establishing one or more "Assessment Areas" within and encompassing a project impact area. Information about the amount of aquatic resource that would be directly and indirectly impacted by a proposed project is recorded. Also recorded are the types of aquatic resources that would be impacted, the condition of assessment areas as scored by CRAM and the primary stressors affecting an assessment area. Information about stressor occurrence is used to determine if the condition of the assessment area can be returned to good condition with minimal management activity.

Also, more intensive "Level 3" sampling may be necessary if there is perceived risk that a proposed discharge of dredge or fill material will cause substantial impact to the aquatic environment within or beyond the project watershed area. Intensive assessment at a proposed project site also can be used to help generate mitigation performance standards (See Review Factor #7).

Both "Level 2" sampling by CRAM and "Level 3" sampling require use of a survey sampling design. The survey sampling design describes how sampling locations will be selected within an assessment area and taking into account specific sampling protocols (e.g., vegetation line transects for Level 3 assessment).

Review Factor 3. Mitigation Category

An assessment is made of the category of compensatory mitigation being proposed to offset direct and indirect project impacts. The categories of compensatory mitigation are restoration, enhancement, establishment and preservation. They are defined in Table 1 (next page).

A “high risk” notation is made if proposed mitigation is based predominantly on preservation or involves the proposed establishment of an aquatic resource type that has not been successfully established within the Level III Ecoregion that encompasses the project impact area.

The scientific literature indicates that establishment mitigation can produce an aquatic resource that lacks proper structure or rates of function as compared to a least-disturbed reference site (NRC, 2001). That risk can be reduced if a proposed establishment mitigation project received a favorable evaluation using the six other review factors.

Review Factor 4. Mitigation Consistency with Watershed Profiles and Watershed Goals

A compensatory mitigation proposal is reviewed to determine the aquatic resource type(s) that will be used to offset an unavoidable impact. The aquatic resource type could be identified either as part of a mitigation bank or within a parcel where permittee-responsible mitigation is proposed.

A “high risk” notation is made if the proposed aquatic resource type is out-of-kind with the watershed profile, would not improve the watershed profile and is inconsistent with watershed goals.

It is important to note that improvements to a watershed profile can be made with mitigation projects that are out-of-kind with an existing profile and yet are still responsive to watershed goals. For example, certain types of wetlands may be re-introduced into a historically altered watershed to meet the needs of water quality improvement or wildlife recovery. Likewise, certain atypical wetland types may be beneficial if they function to meet watershed needs and are actively maintained over time. In those two situations documentation would be need to connect the use of an out-of-kind type of aquatic resource and watershed goals.

Table 1. Definitions of compensatory mitigation categories

The following definitions for the types of mitigation practices are from the federal Compensatory Mitigation Rule, (33 CFR Parts 325/332 and 40 CFR Part 230/Pages 19671-19672.

Restoration means the manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former or degraded aquatic resource. For the purpose of tracking net gains in aquatic resource area, restoration is divided into two categories: reestablishment and rehabilitation.

> Re-establishment means the manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former aquatic resource. Re-establishment results in rebuilding a former aquatic resource and results in a gain in aquatic resource area and functions.
>
> Rehabilitation means the manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area.

Enhancement means the manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s). Enhancement results in the gain of selected aquatic resource function(s), but may also lead to a decline in other aquatic resource function(s). Enhancement does not result in a gain in aquatic resource area.

Establishment (creation) means the manipulation of the physical, chemical, or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site. Establishment results in a gain in aquatic resource area and functions.

Preservation means the removal of a threat to, or preventing the decline of, aquatic resources by an action in or near those aquatic resources. This term includes activities commonly associated with the protection and maintenance of aquatic resources through the implementation of appropriate legal and physical mechanisms. Preservation does not result in a gain of aquatic resource area or functions

As explained in Section 1, watershed profiles are a graphical accounting of the abundance, diversity and condition of aquatic resource types. However, in many situations a watershed profile will not have been constructed for the project watershed area that encompasses a proposed project impact site and its associated mitigation site(s). Assessment can continue using best professional judgment and familiarity with the occurrence of different aquatic resource types in the project watershed area. More accurate watershed profiles can be constructed depending on the availability of aquatic resource maps (e.g., National Wetland Inventory), and the availability of data from completed ambient aquatic resource assessments.

Review Factor 5. Site Suitability for Proposed Mitigation Wetland Type - Landscape Review

A compensatory mitigation proposal is reviewed to determine if its location within a broader landscape setting will sustain the proposed aquatic resource type in good ecological condition.

A "high risk" notation is made if there is insufficient information to inform the assessment, or if the landscape level review concludes that a proposed mitigation site is not ecologically suitable.

<u>Overview of Landscape Review Indicators</u>

Table 2 lists indicators that are used to assess whether a proposed mitigation site is located within a landscape in a way that is likely to achieve its performance criteria (see Review Factor 7). Each indicator is described further in the text below. The indicators are presented as narrative questions with "yes/no" answers. The indicators can be assessed using readily available mapped information or aerial imagery. In some situations, many of the indicators may have already been analyzed in the production of prioritization maps by water quality management and habitat conservation groups. Mitigation practitioners are encouraged to search for such information on the Internet and within cooperating agencies and organizations. The assessment can be performed in the office without a field trip to a proposed mitigation site. Field assessment is described separately in Review Factor 6.

The first indicator listed in Table 2 is assessed for the hydrological "contributing area" that encompasses a proposed mitigation project site. A contributing area means the portion of a watershed that directly contributes water to a proposed mitigation site. Note that a contributing area is different from a project

Table 2: Indicators used in the landscape-level assessment of potential wetland mitigation areas

Landscape Review Indicators	Yes	No
1. Does the contributing area to the proposed mitigation site contain mostly natural land and aquatic resources in relatively good condition?		
2. Does the project watershed area contain a prevalence of the same aquatic resource type being proposed for mitigation?		
3. Does the proposed mitigation site possess hydric soils or is its substrate in relatively good condition?		
4. Is the proposed mitigation site in proximity to an appropriate type of water source needed to support a desired aquatic resource type?		
5. Is there an adequate buffer area to sustain the proposed mitigation site?		
6 Is the proposed mitigation site in close proximity to a significant natural area?		

watershed area. Also, it is important to note that each assessment indicator, by itself, does not provide clear evidence of the landscape suitability of a mitigation site. Rather, it is the combination of indicator information that provides a weight-of-evidence basis for making a determination.

Landscape Review Indicators

Indicator 1: Does the contributing area to the proposed mitigation site contain mostly natural land and aquatic resources in relatively good condition?

Answer "yes" if the contributing area fits the following description: The predominant (> 50%) land cover is natural vegetation and impervious surface density of less than 10%.

If the selected area meets the criterion above, then the local hydrological setting is probably intact. That situation will have a beneficial effect on the sustainability of a mitigation project. In contrast, intensely developed areas pose a risk to mitigation success because of flashy surface water flow conditions, gaps in habitat connectivity and high inputs of sediment, nutrients, and other pollutants. Such risk to mitigation success may increase in situations involving intermittent and ephemeral streams. Coleman et al. (2005) describe significant hydromodification in streams that have as little as 3-5% impervious cover in their catchments.

However, mitigation projects in urban developed areas can support local water quality functions and open space use if sufficiently large in area. If the aquatic resource being impacted plays an important role in its watershed for maintaining local water quality and open space use, then suitable mitigation areas in the watershed should be given priority. Open space use includes providing public access to natural areas in support of community livability and education. A mitigation project in an urban setting may have to include significant engineering design features both on-site and off-site. Those features can include riparian buffers and drainage control structures.

Indicator 2: Does the project watershed area contain a prevalence of the same aquatic resource type being proposed for mitigation?

Answer "yes" if the type of aquatic resource proposed for mitigation is found in abundance in the project watershed area. For wetlands, Table 3 describes characteristics of the main HGM types of wetlands. A query of wetland inventory information about wetlands proximal to a proposed mitigation site will provide some indication of what wetlands can be sustained in that landscape setting. A similar type table can be developed for other aquatic resource types.

Table 3. HGM wetland types in the syllabus focus area.

HGM Wetland Type	Characteristics
Slope – Wet Meadow	Wetlands have surface water originating and flowing through the wetland in one direction and without being impounded. Herbaceous vegetation dominates
Slope – Forested	As above except woody vegetation dominates.
Riverine (Riparian)	Wetlands are in a valley or stream channel where it gets inundated by overbank flooding from that stream or river at least once every two years

Indicator 3: Is the proposed mitigation site in proximity to an appropriate type of water source needed to support a desired aquatic resource type?

Answer "yes" or "no" based on consideration of the type of information in Table 4. The table generally describes the primary source of water for the HGM types of wetlands. A suitable setting for some HGM types of wetlands can be selected, in part, based on their proximity to other types of aquatic systems (e.g., streams).

Table 4. Primary sources of water for HGM type wetlands

HGM Wetland Type	Primary Source of Water
Lake fringe	Lake water
Slope	Groundwater discharge
Riverine	Overbank flow from stream or river on average at least once every two years
Depressional	Groundwater or surface flows from precipitation on the surrounding landscape

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Indicator 4: Is the proposed mitigation site comprised of hydric soils or is its substrate in relatively good condition?

Answer "yes" if the proposed mitigation site is located in an area or in close proximity to an area having mapped hydric soils, or in an area where aquatic resources are not listed as impaired for habitat modification or sedimentation. Also, mitigation can be successful where the substrate is not severely disturbed or is otherwise amenable to the establishment of hydric soil conditions or suitable aquatic substrate.

For wetlands, hydric soils are essential to establishing and sustaining plants adapted to wetland conditions. Additionally, hydric soils (not remnant hydric soils) often indicate that the site may have the necessary water regime to maintain a wetland. Soil maps are widely available and can sometimes be used to determine the occurrence of hydric soils at a proposed mitigation project site. However, many occurrences of hydric soil are not mapped on soil surveys because they fall below the minimum mapping unit. For this reason, the hydric soil indicator must be verified in the field in Review Factor 6. In situations where wetland establishment is proposed, project site suitability can be assessed based on an analysis of the site's adjacency to hydric soils.

Indicator 5: Is there an adequate buffer area to sustain the mitigation site?

Answer "yes" if a ≥100 foot wide buffer of relatively undisturbed vegetation extends at least 75% around the perimeter of the proposed mitigation project site (McElfish et al., 2008).

Buffers are important for meeting mitigation performance goals, because they:

(1) Reduce the effects of stressors near a mitigation project that could impact its functioning and condition;
(2) Support natural hydrogeomorphic processes that could sustain a mitigation project; and
(3) Complement the habitat use that is provided by a mitigation project (e.g., habitat corridor).

Indicator 6: Is the proposed site in close proximity to a significant natural area?

Answer "yes" if a natural area in the vicinity of the proposed mitigation site is managed to sustain its natural features or qualities.

The ecological structure of mitigation projects can be "anchored" by the relatively intact ecological processes of existing natural areas. In turn, mitigation projects may add to the resistance and resilience of existing significant natural areas helping them withstand the effects of future environmental degradation. "Close proximity to" means there is direct connectivity between the mitigation site, and the biological resources or the hydrological characteristics of the natural area.

Making a Determination for Review Factor 5

Answering "Yes" to all assessment indicators in Table 2 supports a preliminary determination that the landscape setting is suitable for a proposed mitigation project. If there is insufficient information about any of the indicators, then the determination for this factor is recorded as "unknown." The reviewer also can decide that the suitability of the site is "unsuitable" if a negative ("No") determination is made on two or more of the indicators, or if a single key indicator (e.g., appropriate water source) is lacking.

The determination is considered "preliminary" until field observations are made as described under Review Factor 6. The mitigation reviewer may choose to reconsider the preliminary determination using best professional judgment. In that situation, the reviewer should document his/her decision by describing the indicators and narrative criteria that guided the determination.

Review Factor 6. Site Suitability for Proposed Mitigation Wetland Type – Field Review

A proposed compensatory mitigation site is reviewed in the field to determine if it is ecologically suitability for use. Consideration is given to both the aquatic resource type being mitigated and the category of mitigation (i.e., restoration, enhancement, establishment, preservation). Three indicators are used to make the determination including an indicator that uses a CRAM score.

A "high risk" notation is made if there is insufficient information to inform the assessment, or if the field level review concludes that a proposed mitigation site is not ecologically suitable.

Overview of Assessment Indicators

The three (3) indicators are used to conduct a field assessment are listed in Table 5. These indicators help determine the likelihood of mitigation project success.

Table 5: Indicators used in the site-level screening of potential wetland mitigation areas		
Field Review Indicators	Yes	No
1. Is the proposed mitigation site located within an appropriate landscape setting?		
2. Is the type of proposed mitigation appropriate given site location?		
3. Can the primary stressors affecting the site can be remedied or significantly reduced?		

Indicator #1: Is the proposed mitigation site located within an appropriate landscape setting?

Field observations are made to confirm preliminary determinations made on each of the indicators described in Factor #1. This assessment is conducted prior to a CRAM assessment. As a reminder the indicators in Factor #1 are:

- Does the contributing area to the proposed mitigation site contain mostly natural land and aquatic resources in relatively good condition?
- Does the project watershed area contain a prevalence of the aquatic resource type being proposed for mitigation?

- Is the proposed mitigation site in proximity to an appropriate type of water source needed to support a desired aquatic resource type?
- Is the site comprised of hydric soils or substrate in relatively good condition?
- Is there an adequate buffer area to sustain the mitigation site?
- Is the proposed site in close proximity to a significant natural area?

Based on field observations, a determination is made whether the proposed mitigation project is located within a landscape setting that can support the desired type of wetland. The preliminary determination made on Factor #1 is sustained or amended by this review.

Indicator #2: Is the proposed mitigation practice appropriate for the proposed site location?

Table 6. Approximate CRAM scores for mitigation categories

Mitigation Category	CRAM Score
Preservation	70-100
Enhancement	25-70
Restoration	< 25
Establishment	Not applicable

A determination that the proposed mitigation practice is appropriate for a given location is based largely on the ecological condition of the site and the stressors affecting that condition. The site's capacity for enhancement, restoration, preservation and/or establishment can be evaluated by where a site quality falls along a gradient of condition, and the amount and type of stress affecting a site.

Table 6 can be used to help make a determination of the type of mitigation best suited to a proposed mitigation site based on a CRAM score. CRAM was designed to assess aquatic resource condition and to evaluate risks to an assessment area caused by stressors. For example, a wetland in good ecological condition, and with few stressors, will generally function at rates typical of its type and landscape setting. A mitigation site with those characteristics may be suitable for preservation, but generally not for enhancement, restoration or establishment.

Indicator #3: Can the primary stressors affecting the proposed mitigation site be remedied?

Stressors affect the functional capacity of aquatic resources by disturbing their primary ecosystem attributes. For wetlands those attributes are buffer and landscape context, hydrology, physical structure, and biological structure. Accordingly, stressors can be categorized by the ecosystem attribute that they most directly impact. For example, stream ditching and diking impact hydrology; farm tillage and off-road vehicles impact soil; and, grazing and nutrient pollutants impact vegetation structure. The design of a mitigation project is evaluated for its effectiveness at controlling or eliminating the intensity and duration of stressors affecting a proposed mitigation area. The design must be capable of sustaining a mitigation wetland over time.

A determination for this indicator is based on the reviewer's best professional judgment about the adequacy of the engineering specifications. The review also takes into consideration the performance of other similarly designed mitigation projects in the region.

<u>Making a determination for Review Factor 6</u>

A positive ("Yes") determination made on all three assessment indicators for Factor 6 (Table 5) means that the site is likely ecologically suitable for proposed mitigation. A negative ("No") determination made on all three indicators means that the site is not ecological suitable. A "mixed" set of determinations means there is uncertainty about site suitability.

Review Factor 7. Mitigation Performance Standards

A mitigation proposal is reviewed to determine whether performance standards exist for the specified aquatic resource types. Consideration also is given to whether the proposal involves a "difficult to replace" aquatic resource type.

A "high risk" notation is made if mitigation is proposed for a "difficult to replace" aquatic resource type that is not part of an available mitigation bank. If the "difficult to replace" aquatic resource type is included within an available mitigation bank, then the mitigation bank should be meeting its performance standards.
A "difficult to replace" aquatic resource type means a type that has not been successfully restored or established in a Level III Ecoregion that encompasses a proposed mitigation site. Difficult to replace wetlands include vernal pools, bogs and fens.

Ecological performance standards are measures of ecosystem characteristics, including structure, condition and/or functional rates. The standards are used to determine if a mitigation project area meets its objectives relative to those measures. The standards are based on established reference values (scores) and include a sampling design for measuring mitigation site performance.

Specific performance standards may or may not exist for specific aquatic resource types being evaluated for use in compensatory mitigation. If applicable performance standards do exist, then there is greater likelihood that a favorable determination will be made on a mitigation proposal. If performance standards do not exist, then they can be developed through completion of the following five tasks.

<u>Tasks for developing mitigation performance standards</u>

Though not a preferred approach, mitigation performance standards are often developed as part of project-specific mitigation planning. In that situation, the following tasks can be accomplished to develop an appropriate set of standards.

<u>Task 1. Establish boundaries for mitigation management units</u>

Performance standards can be developed for either a particular aquatic resource type within a mitigation project, or a mitigation project area that contains multiple aquatic resource types. For example, a hypothetical mitigation bank might contain one dominant type of wetland, interspersed with smaller patches of another type of wetland. If similar restoration and management practices were applied across the entire bank, then one set of performance standards could potentially be developed and monitored. Conversely, if a mitigation bank was comprised of multiple wetland types, and its various areas were managed differently, then multiple performance standards may be necessary.

The decision on how to structure performance standards should take into account the:

a) Size of the mitigation project or bank,
b) Diversity of aquatic resource types present at the site, and
c) Types and extent of mitigation practices applied across the wetland area.

<u>Task 2. Define objectives</u>

Mitigation objectives are narrative statements that characterize the desired aquatic resource type of a mitigation project or mitigation bank, and its ecological condition and/or level of functioning. Objectives also help establish a connection between the functioning of a proposed mitigation project and watershed needs.

Examples of anticipated mitigation outcomes could be high quality wildlife habitat and maintenance of downstream water quantity and quality. Individual management units within a mitigation site may have their own set of objectives.

Mitigation objectives also should include information on the specific stressors that will be remediated and a general account as to how that will be accomplished.

Task 3. Select mitigation performance standards

Performance standards are used to make a determination about whether the objectives of a mitigation site have been attained. The standards are tied to the site-specific ecological attributes of the aquatic resource being managed for mitigation. For wetlands, the three major attributes are hydrology, soils and vegetation.

The condition or "performance" of each attribute is measured in terms of its structure, its rates of functioning and/or the occurrence of stressors affecting the attribute. The selection of which type of measure to use is based on the amount of certainty needed for reporting performance and guiding any needed corrective actions. Specific performance standards for a mitigation site can be expressed as:

- Individual CRAM metrics (e.g., plant community metric);
- Floristic quality or stream-based index of biological integrity;
- Wildlife occurrence;
- Occurrence of alien invasive plants;
- A specified range of water level fluctuation; and/or
- Carbon accumulation.

Performance standards are scaled to least-disturbed reference condition within the project watershed area or the broader ecoregion.

Task 4. Describe the design of the mitigation monitoring program

Each mitigation management area will have a sampling design linked to the area's mitigation objectives and performance standards. The sampling design also may include the use of supplemental monitoring indicators to support implementation of a mitigation plan's adaptive management strategy. For example, if a particular vegetation-based performance standard is not met (e.g., percent native co-dominant species richness), then information generated by a supplemental hydrological indicator (e.g., water level fluctuation) can be used to help diagnose the cause of the problem and implement an adaptive management response.

Task 5. Describe the sampling and reporting frequency of the mitigation monitoring program

The mitigation monitoring program should specify the:

a. Frequency of environmental sampling on the mitigation site and surrounding area;
b. Frequency of compliance reporting of analyzed sampling results; and
c. Duration of monitoring for permit compliance or mitigation bank certification.

SECTION 3 – MAKING A MITIGATION DETERMINATION

The results of an assessment of a proposal for compensatory mitigation can be summarized using the checklist in Figure 3. The summation presents in one place the technical information used to make a mitigation determination based on weight-of-evidence. Specific assessment results are shown ("checked") for each of the review factors. Also, a default set of "high risk concerns" are listed for the review factors. The presumption is that if any of the high risk concerns are checked, then a proposed mitigation project will not likely meet the regulatory program goal of achieving a no net loss in the quantity and quality of aquatic resources. In that situation, the use of greater than typical mitigation ratios and administrative assurances are justified (See Section - "General Compensatory Mitigation Requirements"). Based on that determination, the regulatory review process can proceed toward consideration of final engineering plans and specifications for proposed mitigation. If one or more review factors are not assessed, then there is insufficient information to make an informed decision. In that situation a project proponent may be asked for more information by agency staff.

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Appendix A -- Questions and Answers

This appendix elaborates on certain issues that may arise in the project impact and mitigation review process.

Questions and Answers

(1) How can watershed profiles be used to assess the impacts of proposed dredge and fill projects on aquatic resources, and used for alternatives analysis?

Impact assessment has typically focused on the tallying of the amounts of conversion or degradation of individual types of aquatic resources. Use of watershed profiles provides a way of integrating that type of assessment with the broader need to sustain and improve the overall abundance, diversity and condition of all aquatic resource in a watershed. In other words, watershed profiles are a type of broad scale reference for evaluating site specific impact.

For example, formal alternatives analysis is used to avoid impacts to any aquatic resource area of significant size and importance to maintaining beneficial uses. Presumably, more rigorous alternative analysis is needed when a proposed project poses risk to an individual aquatic resource area and poses a risk of substantially degrading the overall profile of the encompassing project watershed area.

Substantial degradation of a watershed profile can be attributed to a number of different scenarios. For example, a small loss in area of one type of aquatic resource in a project watershed area can have a wide ranging effect on the condition of other types of aquatic resource, and cause the substantial degradation of a profile. Water control structures can produce this effect. The loss or degradation of a small area of a relatively rare type of aquatic resource also can substantially degrade of a watershed profile.

(2) Can watershed profiles also be used to assess cumulative impacts and compliance with the State's antidegradation policy?

As explained in Question #1, watershed profiles can be used to cumulatively account for impacts to multiple aquatic resource types within a project watershed area. Similarly, offsets attributed to proposed compensatory mitigation also can be accounted using profiles. Any remaining, unmitigated impacts can be defined as contributing to cumulative impacts. Antidegradation policy becomes a critical issue in situations where a cumulative impact jeopardizes a specified aquatic resource beneficial use. In those situations, conceptual models and a weight-of-evidence approach is used to establish the link between a degraded watershed profile and loss of beneficial use support. Results from such analysis can be used to justify a denial of water quality certification.

(3) Do the assessment factors described in the syllabus apply to credit and debit accounting for mitigation banks and in-lieu fee programs?

The process used for technically reviewing a proposed mitigation bank or for the identification of an in-lieu fee area will rely on the same assessment framework as described in the syllabus. For example, wetland mitigation bank credits are established based on the acreage, type and ecological condition of wetlands in the bank; and the category of mitigation used to establish the bank. An operational mitigation bank can optimally generate one acre-credit of a type of wetland if the bank restored or established one acre of that type of wetland to specified performance standards. Performance standards and related "milestones" are specified in a mitigation bank's credit release schedule. Partial credits can be accounted in banks that also include enhancement and preservation categories of mitigation.

Also, a mitigation bank service area can be aligned with a project watershed area as defined in the syllabus.

(4) How do we evaluate the environmental acceptability of geographical boundaries proposed for a mitigation bank or in-lieu fee service areas?

Evaluation begins with a description of the aquatic resource types being accounted in the mitigation bank. For example, the hydrogeomorphic (HGM) classification system can be used in conjunction with an appropriate vegetation classification system (e.g., National Vegetation Classification System).

The environmental acceptability of the service area boundary is based on how well the aquatic resource types of the mitigation bank complements or otherwise corresponds to the watershed profile of the proposed service area. Generally speaking, the service area should be contained within the area intersecting an 8-digit Hydrologic Unit (HUC), a mapped watershed unit of similar scale (if available) and an associated Level III Ecoregion. A 10-digit HUC and associated Level IV Ecoregon may form a more environmental acceptable boundary in some types of hydrologic landscape. For example, impacts to a wetland located at higher elevations in the Sierra Nevada region of California generally cannot be compensated at a lower elevation mitigation site (i.e., within same 8-digit HUC and Level IV Ecoregion).

(5) How do we comparatively evaluate the environmental acceptability of onsite versus offsite compensatory mitigation, including the use mitigation banks and in-lieu fee areas?

Evaluation begins with a description of the aquatic resource type being impacted. The evaluation continues by considering which of the following scenarios is best suited for meeting mitigation needs and specified mitigation performance standards (i.e., Review Factors 5 and 6):

1. Use of an approved mitigation bank or in-lieu fee site that has a service area that encompasses a proposed wetland impact site;

2. “Onsite” areas adjacent or neighboring the proposed impact site;

3. “Offsite” areas within the contributing area of the proposed impact site;

4. “Offsite” at other ecologically suitable areas within the project watershed area.

For example, permittee-responsible onsite or offsite mitigation is preferred in situations where a mitigation bank or in-lieu fee site is not expected to sustain a selected type of wetland, or function at levels needed to offset impacts. Also, on-site compensatory mitigation will be favored in situations involving the placement of a mitigation project in close proximity to a significant natural area. In some situations, a combination of onsite, offsite and mitigation bank crediting may be required to meet compensatory mitigation needs.

(6) In what situations might the placement of mitigation projects benefit a highly disturbed urban area?

Several factors of the syllabus focus on the benefits of placing mitigation projects in a relatively undisturbed, non-urban setting. This geographical prioritization helps ensure project sustainability and its likelihood of achieving desired performance. In urban settings, concern over mitigation site performance can be overcome if project proponents provide detailed (intensive) site information that predicts a desired functional rate of a mitigation project and with a known level of certainty. In the alternative, the proponents must demonstrate that the project complements components of a publically adopted urban watershed management plan or related environmental plan.

The risk of mitigation project failure in urban settings can be high. Therefore, it is best to approach urban wetland mitigation through impact avoidance. In general, the beneficial cumulative effect of compensatory mitigation projects in urban settings is far less than, say, the benefits delivered by water quality management activity. In contrast, the impact avoidance component of a mitigation program can provide major benefits toward helping sustain the aquatic environment of an urban area.